Amendments to the Specification

Please replace the title by the following amended title: A ~~ELECTRICAL DEVICES AND~~ PROCESS FOR MANUFACTURING A COMPOSITE POLYMERIC CIRCUIT PROTECTION DEVICE ~~MAKING SUCH DEVICES~~

Please replace paragraph **[0001]** with the following amended paragraph:

[0001] This application is a continuation-in-part application of copending, commonly assigned Application Serial No. 09/395,869, filed September 14, 1999, now U.S. Patent No. 6,640,420, issued November 4, 2003, and a continuation-in-part application of copending, commonly assigned International Application No. PCT/US00/25118, filed September 13, 2000, the disclosure of each of which is incorporated herein by reference.

Please replace paragraph **[0003]** with the following amended paragraph:

[0003] Circuit protection devices comprising a conductive polymer composition having a positive temperature coefficient (PTC) are well-known. Such devices which are intended for surface mounting onto a substrate, e.g. a printed circuit board, are disclosed in U.S. Patents Nos. 5,831,510 (Zhang et al), 5,852,397 (Chan et al), and 5,864,281 (Zhang et al), and International Publications Nos. 94/01876 (Raychem Corporation) and 95/08176 (Raychem Corporation), and copending, commonly assigned Application No. 09/181,028 (Graves et al, filed October 27, 1998), now U.S. Patent No. 6,651,315, issued November 25, 2003, the disclosures of which are incorporated herein by reference. Such circuit protection devices generally comprise first and second laminar electrodes; a laminar PTC resistive element sandwiched between the electrodes; a third (residual) laminar conductive member which is secured to the same face of the PTC element as the second electrode but is separated therefrom; and a cross-conductor which passes through an aperture in the PTC element and connects the third conductive member and the first electrode. This permits connection to both electrodes from the same side of the device, so that the device can be connected flat on a printed circuit board, with the first electrode on top, without any need for leads. The resistive element preferably comprises a laminar element composed of a PTC conductive polymer. Preferably the device comprises an additional conductive member and an additional cross-conductor, so that the device is symmetrical and can be placed either way up on a circuit board.

Please replace paragraph **[0005]** with the following amended paragraph:

[0005] As described in copending, commonly assigned U.S. Patent Application No. 09/060,278 (Chiang et al, filed April 14, 1998), now U.S. Patent No. 6,606,023, issued August 12, 2003, and its counterpart International Patent Publication No. WO99/53505 (Raychem Corporation, published October 21, 1999), the disclosure of each of which is incorporated herein by reference, composite devices can be prepared by sorting individual devices and then assembling the sorted devices into composite devices. Such a process can be tedious, as it may require that the resistance of each individual device be read. We have now found, in accordance with the present invention, that it is possible to prepare a multilayer assembly from which individual composite devices can be divided. Such an assembly allows preparation of a large number of composite devices simultaneously. Furthermore, because the process described herein allows the patterning of individual layers of the assembly before or after fabrication into the assembly, a variety of different devices can be prepared from the same starting layers. In addition, the composition of the layers can be easily varied, allowing the simple build-up of devices with combined functionality. Various interconnection schemes between layers can be simply implemented, and devices with multiple external electrical contacts can be made without changing the basic manufacturing process. All of these further add to the broad range of different devices which can be inexpensively mass-produced by the process disclosed herein.

Please replace paragraph **[0038]** with the following amended paragraph:

[0038] The PTC compositions used in the present invention are preferably conductive polymers which comprise a crystalline polymer component and, dispersed in the polymer component, a particulate filler component which comprises a conductive filler, e.g. carbon black or a metal. The filler component may also contain a non-conductive filler, which changes not only the electrical properties of the conductive polymer but also its physical properties. The composition can also contain one or more other components, e.g. an antioxidant, crosslinking agent, coupling agent, flame retardant, or elastomer. The PTC composition preferably has a resistivity at 23°C of less than 50 ohm-cm, particularly less than 10 ohm-cm, especially less than 5 ohm-cm. Suitable conductive polymers for use in this invention are disclosed for example in U.S. Patents Nos. 4,237,441 (van Konynenburg et al), 4,304,987 (van Konynenburg), 4,514,620 (Cheng et al), 4,534,889 (van Konynenburg et al), 4,545,926 (Fouts et al), 4,724,417 (Au et al),.4,774,024 (Deep et al), 4,935,156 (van Konynenburg et al), 5,049,850 (Evans et al), 5,378,407 (Chandler et al), 5,451,919 (Chu et al), 5,582,770 (Chu et al), 5,747,147 (Wartenberg et al), and 5,801,612 (Chandler et al), and U.S. Patent Application No. 09/364,504 (Isozaki et al, filed July 30, 1999), now U.S. Patent No. 6,358,438, issued March 19, 2002. The disclosure of each of these patents and applications is incorporated herein by reference.

Please replace paragraph **[0044]** with the following amended paragraph:

[0044] Particularly useful devices made by the process of the invention comprise at least two metal foil electrodes, with polymer elements sandwiched between them. An especially useful device will comprise a stack comprising *n* polymeric PTC elements, each having two metal foil electrodes, and *(n-1)* adhesive layers sandwiched between the PTC elements in an alternating pattern to form a composite device, with the PTC elements comprising the top and bottom components of the stack. This device will have the electrodes electrically connected such that the PTC elements will be connected in parallel, resulting in a composite device which has a low resistance at 20°C, generally less than 10 ohms, preferably less than 5 ohms, more preferably less than 1 ohm, particularly less than 0.5 ohm, with yet lower resistance being possible, e.g. less than 0.05 ohm. Particularly suitable foil electrodes are microrough metal foil electrodes, in particular as disclosed in U.S. Patents Nos. 4,689,475 (Matthiesen) and 4,800,253 (Kleiner et al), and in copending, commonly assigned U.S. Application No. 08/816,471 (Chandler et al, filed March 13, 1997), now U.S. Patent No. 6,570,483, issued May 27, 2003, and its counterpart application, International Patent Publication No. WO95/34081 (Raychem Corporation, published December 14, 1995), the disclosure of each of which is incorporated herein by reference. The electrodes can be modified so as to produce desired thermal effects and so as to provide electrical contact points for various interconnection points between the layers of the composite device to give the desired functionality, and to provide electrical contact points for mounting the device onto printed circuit boards, sockets, clips, or other suitable applications. Examples of composite devices which incorporate multiple internal and external contact points are illustrated in Figures 16 to 20, 22, and 23.

Please replace paragraphs **[0092]** and **[0093]** with the following amended paragraphs:

[0092] Figure 26 is an exploded view of a stack 1 in which a single etched and drilled conductive laminate layer 117 is sandwiched between two nonconductive laminar layers 116,116'. Each nonconductive laminar layer, which may be an adhesive, e.g. an epoxy pre-preg, may comprise one or more separate layers. Laminar metal foil layers 120,121 are attached to nonconductive laminar layers 116,116', and form the outer layers of the stack. When the layers are laminated together by means of heat and pressure, the adhesive will fill the apertures in conductive laminate 117. Following processing, individual devices 2, shown in Figure 27, can be separated from stack 1. Electrical connection pads 122, formed from metal foil layer 120, are used to attach one or more electrical components, e.g. a silicon device, to the surface of the device. Attachment of components is disclosed in copending,

commonly assigned U.S. Application No. 09/425,519 (filed October 22, 1999), now U.S. Patent No. 6,331,763, issued December 18, 2001, and its counterpart application, International Patent Application No. PCT/US00/07081 (filed March 17, 2000), the disclosure of each of which is incorporated herein by reference. Electrical connection pads 123, formed from metal foil layer 121, are used to attach the device to a circuit board or other substrate. First and second transverse members 31 and 51, respectively, are plated with layers 32 and 52. An "isolated" transverse member or via 124 is also present. This is formed from an adhesive-filled aperture through which another hole is drilled and plated.

[0093] Figure 28 is a perspective view of a device in which a single etched and drilled conductive laminate layer 117 is sandwiched between two nonconductive laminar layers 116,116', in a similar manner to the device of Figure 27. Positioned on one external surface of the device are contact pads 125, e.g. a hard-gold layer applied on top of a laminar metal foil layer such as element 120 shown in Figure 26. On the opposite external surface are positioned a plurality of electrical connection (solder) pads 123 (not shown in this perspective), formed from metal foil layer 121 and solder plated. Three isolated transverse members 124 connecting to the solder pads 123 and/or contact pads 125 and two transverse members 31 connecting one surface of the conductive polymer laminate 117 to the other surface are present.